REMARKS

Rejection Under 35 U.S.C. §102(b)

The examiner rejected claims 15, 17, and18 under 35 U.S.C. §102(b) as being anticipated by Watts et al. Applicants have canceled claims 15, 17, and 18, obviating the need to respond to this rejection.

Rejection Under 35 U.S.C. §103(a) Based on Watts and Kaufman

The examiner rejected claims 16, 19, and 20 under 35 U.S.C. §103(a) as being unpatentable over Watts further in view of Kaufman et al. Applicants canceled claims 16, 19, and 20, obviating the need to respond to this rejection.

Rejection Under 35 U.S.C. §103(a) Based on Watts and Payne

The examiner rejected claim 21 under 35 U.S.C. §103(a) as being unpatentable over Watts further in view of Payne. Applicants have canceled claim 21, obviating the need to respond to this rejection.

Rejection Under 35 U.S.C. §103(a) Based on Watts and Li

The examiner rejected claim 22 under 35 U.S.C. §103(a) as being unpatentable over Watts in view of Li et al. That combination would not have rendered obvious the slurry of claim 22. That claim specifies a slurry that includes:

about 14.7 grams per liter of a citric acid salt;

between about 4.4% and about 8.8% by volume of a silica based abrasive; and

about .38 grams per liter of a 30% H_2O_2 solution.

Applicants developed the slurry of claim 22 in response to a need for a slurry that enabled a copper layer, a barrier layer, and a dielectric layer to be polished at similar rates. As applicants' Examples 1 and 3 demonstrate, the claim 22 slurry facilitates that outcome, thus reducing copper "dishing" and "fangs" that often result when currently available slurries are used to polish those layers.

These examples specify a slurry that includes 14.7 grams of potassium citrate per liter of slurry, 0.38 grams of a 30% H_2O_2 solution per liter of slurry (equivalent to 0.0033 molar), 8.8 volume % of a precipitated silica abrasive, and a water solvent. The Example 1 slurry removed tantalum at about 590 angstroms per minute, copper at about 694 angstroms per minute, and SiOF at about 610 angstroms per minute. The Example 3 slurry, which also included 14 ppm of a biocide, removed tantalum at about 638 angstroms per minute, copper at about 625 angstroms per minute, and SiOF at about 660 angstroms per minute.

Watts describes a slurry that includes a citrate salt (e.g., potassium citrate), an alumina abrasive, and an H_2O_2 oxidizing agent. Watts mentions that a silica abrasive may be used in lieu of the alumina abrasive. Watts further describes including these components in the slurry in the following amounts: 0.2 weight percent to 20 weight percent (and preferably 0.8 weight percent to 1.3 weight percent) of the citrate salt; 0.2 weight percent to 5 weight percent (and preferably 1.0 weight percent to 1.5 weight percent) hydrogen peroxide; and 1.0 weight percent to 12 weight percent (and preferably 2.0 weight percent to 4.0

weight percent) of the alumina abrasive. Watts discloses as a preferred solution one with 1.2 weight percent hydrogen peroxide, 1.1 weight percent ammonium citrate, and 3.0 weight percent alumina slurry.

Watts does not describe a slurry that includes "about 14.7 grams per liter of a citric acid salt." Nor does Watts describe a slurry that includes "between about 4.4% and about 8.8% by volume of a silica based abrasive." (Although Watts mentions that a silica abrasive may be used in place of Watts' alumina abrasive, Watts does not specify the amount of such a silica abrasive that should be included in the slurry.) Moreover, Watts does not describe a slurry that includes "about .38 grams per liter of a 30% H_2O_2 solution."

Although Watts indicates that a slurry for polishing copper may include these three components, Watts does not describe a slurry that includes these components in the amounts that claim 22 requires for polishing copper, barrier and dielectric layers at similar rates. Nor does Watts recognize the desirability of polishing copper, barrier, and dielectric layers at similar rates, or suggest that Watts' slurry can enable that result. Because Watts fails to appreciate the need for a slurry capable of performing that function, Watts does not offer any teaching or suggestion that would have motivated those skilled in the art to modify the slurry Watts describes to generate the slurry of applicants' claim 22 – which enables copper, barrier, and dielectric layers to be polished at similar rates.

Li does not provide any teaching that may compensate for Watts' deficient disclosure. Because neither Watts nor Li offers any suggestion that would have

motivated one skilled in the art to modify Watts' slurry to generate the slurry of claim 22, the claim 22 slurry would not have been obvious in view of these references' combination. Consequently, applicants respectfully request the examiner to withdraw the rejection of claim 22, based on Watts and Li purportedly rendering the slurry of that claim obvious.

Rejection Under 35 U.S.C. §103(a) Based on Watts, Li and Kaufman

The examiner rejected claim 23 under 35 U.S.C. §103(a) as being unpatentable over Watts in view of Li, further in view of Kaufman. Claim 23 depends upon claim 22. Because the slurry of claim 22 would not have been obvious in view of those described in the cited references, as explained above, the claim 23 slurry likewise is patentable over the slurries that those references describe for that reason alone.

In addition, claim 23 specifies a slurry that comprises "about 8.8% by volume of a precipitated silica abrasive." That slurry thus matches the slurry of applicants' Examples 1 and 3 -- shown to enable copper, barrier, and dielectric layers to be polished at similar rates. Because neither Watts, Li, nor Kaufman provides any teaching or suggestion that would have motivated one skilled in the art to modify Watts' slurry to generate the claim 23 slurry, those references' disclosures would not have rendered the claimed slurry obvious.

Conclusion

Because the cited references do not provide any teaching that would have motivated one skilled in the art to modify the slurries they describe to generate the claimed slurries, the pending claims are patentable over those references –

either when considered alone or in combination. Accordingly, applicants respectfully request the examiner to allow pending claims 22 and 23 to issue over the cited references.

Respectfully submitted,

Date: September 12, 2003

Mark Seeley
Reg. No: 32,299
ATTORNEY FOR APPLICANTS

Intel Corporation
Mail Stop SC4-202
2200 Mission College Blvd.
Santa Clara, CA 95052-8119
(408) 765-7382